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| EXAMINER | |
|---|---|
| STULTZ, JESSICA T | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2873 | |

DATE MAILED: 02/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/719,222 | JILANI ET AL. | |
| | Examiner | Art Unit | |
| | Jessica T Stultz | 2873 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1103*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 26-30 recite limitations that do not correspond with dependent claims 23, 14, or 13; specifically, claim 26 recites "a post, a flexure and supports on the flexure", which have already been claimed in claim 14; claims 27-29 recite "means for selectively positioning", a limitation which is not present in claims 23, 14, or 13 and claim 30 recites "said drive means", a limitation which is not present in claims 23, 14, or 13. There is insufficient antecedent basis for these limitations in the claims, creating a lack of clarity in the claims. From what is disclosed in the specification and drawings it is assumed that claims 26-30 depend from claim 25, rather than from claim 23, specifically wherein the preambles to claims 26-30 read "The device of claim 25" (this being the assumed meaning for purposes of examination).

### *Claim Objections*

Claims 26, 32, and 40 are objected to because of the following informalities: in claim 26, "wherein said said micro-mirror" should be "wherein said micro-mirror"; in claim 32, "according to said basis" should be "according to said bias"; and in claim 40, the claim needs to end in a period, specifically "arranged in an array" should be "arranged in an array.". Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 4-7, 9-11, 13-14, 16-19, 21-23, 25-26, 28-33, 35-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Meier et al.

Regarding claim 1, Meier et al discloses a micro-mirror device comprising: a micro-mirror (Column 8, lines 16-63, wherein the micro-mirror is "302", Figures 3-4); and a flexure spring supporting the micro-mirror (Column 8, lines 16-63, wherein the flexure spring is spring ring "328", Figures 3-4); wherein the flexure spring is configured to store potential energy during movement of the micro-mirror that is released as kinetic energy to drive movement of the micro-mirror when the micro-mirror is re-oriented (Column 8, lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claim 2, Meier et al further discloses the flexure spring comprising: a post (Figures 3-4, wherein the posts are "116"); a flexure supported on the post (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", Figures 3-4); and supports on the flexure for supporting the micro-mirror (Column 12, lines 26-48, wherein the supports on the flexure are the torsion beams "320", which connect beam yoke "314" and spring ring "328", wherein support "326" connects yoke "314" to micro-mirror "302", Figures 3-4).

Regarding claim 4, Meier et al further discloses electrodes for electrostatically driving the flexure spring to controllably orient the micro-mirror (Column 8, lines 50-63, wherein the electrodes "310" drive the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 5, Meier et al further discloses drive circuitry for driving the spring to orient the micro-mirror (Column 8, lines 50-63 and Column 16, lines 16-19, wherein the electrodes "310" and metallization "312" comprise the drive circuitry that drives the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claims 6-7, Meier et al further discloses that the flexure spring is supported on a substrate, specifically a silicon substrate (Column 5, lines 20-54, wherein the silicon substrate is "104", Figures 3-4).

Regarding claim 9, Meier et al further discloses that the flexure runs diagonally between opposite corners of the micro-mirror (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", wherein the torsion beams "320" and yoke "314" run diagonally between the corners of the micro-mirror "302", Figures 3-4).

Regarding claim 10, Meier et al further discloses the flexure has a non-uniform width (Shown in Figures 3-4, wherein the spring ring "328", torsion beams "320", and yoke "314" do not have a uniform width).

Regarding claim 11, Meier et al further discloses that the flexure comprises a plurality of flexures extending from the post along an underside of the micro-mirror (Shown in Figures 3-4, wherein the plurality of flexures are torsion beams "320", which are extensions from the flexure spring "328").

Regarding claim 13, Meier et al discloses an array of micro-mirrors comprising (Column 8, lines 16-63, wherein the DMC comprises an array of micro-mirrors "302", Figure 3): a plurality of micro-mirrors (Column 8, lines 16-63, wherein the micro-mirrors are "302", Figure 3); and a flexure spring supporting each micro-mirror (Column 8, lines 16-63, wherein the

flexure springs are "328", Figures 3-4); wherein each flexure spring is configured to store potential energy during movement of a corresponding micro-mirror that is released as kinetic energy to drive movement of the corresponding micro-mirror when the corresponding micro-mirror is re-oriented (Column 8, lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claim 14, Meier et al further disclose the flexure spring comprising: a post (Figures 3-4, wherein the posts are "116"); a flexure supported on the post (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", Figures 3-4); and supports on the flexure for supporting the micro-mirror (Column 12, lines 26-48, wherein the supports on the flexure are the torsion beams "320", which connect beam yoke "314" and spring ring "328", wherein support "326" connects yoke "314" to micro-mirror "302", Figures 3-4).

Regarding claim 16, Meier et al further discloses a corresponding set of electrodes for electrostatically driving the flexure spring to controllably orient the micro-mirror (Column 8, lines 50-63, wherein the electrodes "310" drive the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 17, Meier et al further discloses drive circuitry for driving the springs to orient the micro-mirror in response to incoming image data (Column 5, lines 21-36, Column 8, lines 50-63, Column 16, lines 16-19, and Column 18, lines 1-15, wherein the electrodes "310" and metallization "312" comprise the drive circuitry that drives the spring "328" to orient micro-mirror "302" in response to incoming image data, Figures 3-4).

Regarding claims 18-19, Meier et al further discloses that the flexure springs are supported on a substrate, specifically a silicon substrate (Column 5, lines 20-54, wherein the silicon substrate is "104", Figures 3-4).

Regarding claim 21, Meier et al further discloses that the flexure runs diagonally between opposite corners of the corresponding micro-mirror (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", wherein the torsion beams "320" and yoke "314" run diagonally between the corners of the micro-mirror "302", Figures 3-4).

Regarding claim 22, Meier et al further discloses the flexure has a non-uniform width (Shown in Figures 3-4, wherein the spring ring "328", torsion beams "320", and yoke "314" do not have a uniform width).

Regarding claim 23, Meier et al further discloses that the flexure comprises flexures extending from the post along an underside of the corresponding micro-mirror (Shown in Figures 3-4, wherein the plurality of flexures are torsion beams "320", which are extensions from the flexure spring "328").

Regarding claim 25, Meier et al discloses a micro-mirror device comprising: a micro-mirror (Column 8, lines 16-63, wherein the micro-mirror is "302", Figures 3-4); means for selectively positioning the micro-mirror in a desired orientation (Column 8, lines 16-63, wherein the means for selectively positioning the micro-mirror "302" is spring ring "328", Figures 3-4); wherein the means for selectively positioning the micro-mirror are configured to store potential energy during movement of the micro-mirror, which potential energy is released as kinetic energy to drive movement of the micro-mirror when the micro-mirror is re-oriented (Column 8,

lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claim 26, Meier et al further disclose the micro-mirror comprise a flexure spring (Column 8, lines 16-63, wherein the micro-mirror "302" includes a spring ring "328", Figures 3-4) comprising: a post (Figures 3-4, wherein the posts are "116"); a flexure supported on the post (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", Figures 3-4); and supports on the flexure for supporting the micro-mirror (Column 12, lines 26-48, wherein the supports on the flexure are the torsion beams "320", which connect beam yoke "314" and spring ring "328", wherein support "326" connects yoke "314" to micro-mirror "302", Figures 3-4).

Regarding claim 28, Meier et al further discloses that the means for selectively positioning the micro-mirror comprise and electrostatic means for controllably orienting the micro-mirror (Column 8, lines 50-63, wherein the electrodes "310" drive the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 29, Meier et al further drive means, electrically connected to the mean for selectively positioning the micro-mirror for driving the means for selectively positioning the micro-mirror to orient the micro-mirror (Column 8, lines 50-63 and Column 16, lines 16-19, wherein the electrodes "310" and metallization "312" comprise the drive circuitry that drives the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 30, Meier et al further discloses that the drive means respond to incoming image data (Column 5, lines 21-36, Column 8, lines 50-63, Column 16, lines 16-19,

and Column 18, lines 1-15, wherein the electrodes "310" and metallization "312" comprise the drive circuitry that drives the spring "328" to orient micro-mirror "302" in response to incoming image data, Figures 3-4).

Regarding claim 31, Meier et al discloses a spatial light modulation device (Column 1, lines 36-44, wherein the DMD is a light modulation device, Figures 3-4) comprising: a micro-mirror (Column 8, lines 16-63, wherein the micro-mirror is "302", Figures 3-4); and a pliant flexure supporting the micro-mirror, the flexure having a bias (Column 8, lines 16-63, wherein the flexure supporting the micro-mirror "302" is spring ring "328", wherein the bias is the undeflected state of the mirror "302", Figures 3-4); wherein the flexure stores energy when the micro-mirror and flexure are moved against the bias, wherein the flexure releases the stored energy to drive movement of the micro-mirror when a force against the bias is relaxed (Column 8, lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claim 32, Meier et al further discloses that the flexure holds the micro-mirror in a default orientation to the bias when the flexure is not driven (Column 8, lines 16-63, wherein the flexure "328" holds the mirror in an undeflected state when not driven, Figures 3-4).

Regarding claim 33, Meier et al further disclose the pliant flexure comprising: a post (Figures 3-4, wherein the posts are "116"); a flexure member supported on the post (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314", Figures 3-4); and supports on the flexure for supporting the micro-mirror (Column 12, lines 26-48, wherein the supports on the flexure are the torsion beams "320", which connect

beam yoke "314" and spring ring "328", wherein support "326" connects yoke "314" to micro-mirror "302", Figures 3-4).

Regarding claim 35, Meier et al further discloses a set of electrodes for electrostatically driving the pliant flexure to controllably orient the micro-mirror (Column 8, lines 50-63, wherein the electrodes "310" drive the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 36, Meier et al further discloses drive circuitry for driving the flexure to orient the micro-mirror (Column 8, lines 50-63 and Column 16, lines 16-19, wherein the electrodes "310" and metallization "312" comprise the drive circuitry that drives the spring "328" to orient micro-mirror "302", Figures 3-4).

Regarding claim 37, Meier et al further discloses that the flexure runs diagonally between opposite corners of the micro-mirror (Column 8, lines 16-63, wherein the flexure comprises spring ring "328", torsion beams "320", and yoke "314" and the torsion beams "320" and yoke "314" run diagonally between the corners of the micro-mirror "302", Figures 3-4).

Regarding claim 38, Meier et al further discloses the flexure has a non-uniform width (Shown in Figures 3-4, wherein the spring ring "328", torsion beams "320", and yoke "314" do not have a uniform width).

Regarding claim 39, Meier et al further discloses that the flexure comprises a plurality of flexures extending from the post along an underside of the micro-mirror (Shown in Figures 3-4, wherein the plurality of flexures are torsion beams "320", which are extensions from the flexure spring "328").

Regarding claim 40, Meier et al further discloses a device comprising a plurality of micro-mirror in an array (Column 8, lines 16-63, wherein the DMD comprises an array of micro-mirrors, Figure 3).

Regarding claim 41, Meier et al discloses a method of forming a micro-mirror device (Column 8, lines 16-63, wherein the micro-mirror is "302", Figures 3-4), the method comprising: forming a flexure spring on a substrate (Column 8, lines 16-63, wherein the flexure spring "328", is formed on substrate "104", Figures 3-4); and forming a micro-mirror supported on the flexure spring (Column 8, lines 16-63, wherein the micro-mirror is "302", Figures 3-4).

Regarding claim 42, Meier et al further discloses a method wherein the flexure spring configured to store potential energy during movement of the micro-mirror that is released as kinetic energy to drive movement of the micro-mirror when the micro-mirror is re-oriented (Column 8, lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claim 43, Meier et al further discloses a method wherein the flexure spring is pliant and has a bias (Column 8, lines 16-63, wherein the flexure supporting the micro-mirror "302" is spring ring "328", wherein the bias is the undeflected state of the mirror "302", Figures 3-4); wherein the flexure stores energy when the micro-mirror and flexure are moved against the bias, and wherein the flexure releases the stored energy to drive movement of the micro-mirror when a force against the bias is relaxed (Column 8, lines 31-49, wherein the spring ring "328" stores potential energy when the mirror is deflected and releases the stored energy when the mirror "302" is returned to the undeflected state, i.e. re-oriented, Figures 3-4).

Regarding claims 44-45, Meier et al further discloses a method wherein the flexure spring and micro-mirror are formed by depositing material and selectively etching the deposited material (Column 15, line 66-Column 17, line 42).

Regarding claim 46, Meier et al further discloses forming an array of micro-mirrors supported by the flexure spring (Column 8, lines 16-63, wherein the DMD comprises an array of micro-mirrors "302", Figure 3).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 15, 27, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meier et al, as applied to independent claims 1, 13, 25, and 31 as shown above, in view of Culp.

Regarding claims 3, 15, 27, and 34, Meier et al discloses a spatial light modulation device comprising an array of micro-mirrors as shown above, but does not specifically disclose that the means for selectively positioning the micro-mirror, specifically the pliant flexure spring, comprise a piezoelectric element configured to orient the corresponding micro-mirror. Culp teaches of a mirror which is oriented by springs driven by piezoelectric elements (Column 2, line 5-Column 3, line 21, wherein the piezoelectric elements "14, 16, 18, 20, and 22"/"64" drive spring means "32"/"56" which orient mirror "28"/"54", Figures 1-3) for the purpose of imparting energy and detecting energy and to supply signal as to the force or magnitude or direction of impact of the mirror and to thrust the mirror in the selected positions (Column 3, lines 14-21).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the micro-mirror device of Meier et al as shown above to further include the means for selectively positioning the micro-mirror, specifically the pliant flexure spring, comprising a piezoelectric element configured to orient the corresponding micro-mirror since Culp teaches of a mirror which is oriented by springs driven by piezoelectric elements for the purpose of imparting energy and detecting energy and to supply signal as to the force or magnitude or direction of impact of the mirror and to thrust the mirror in the selected positions.

Claims 8 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meier et al, as applied to independent claims 1 and 13 as shown above, in view of Shrauger et al.

Regarding claims 8 and 20, Meier et al discloses an array of micro-mirrors as shown above, but does not specifically disclose that the substrate comprises glass. Shrauger et al teaches of a device including mirrors oriented by springs located on a substrate comprising glass (Column 2, line 61-Column 3, line 35) for the purpose of providing a substrate transparent to the optical spectrum to assure maximum optical power (Column 3,lines 7-35). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the array of micro-mirrors of Meier et al to further include a substrate made of glass since Shrauger et al teaches of a device including mirrors oriented by springs located on a substrate comprising glass for the purpose of providing a substrate transparent to the optical spectrum to assure maximum optical power.

Claims 12 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meier et al, as applied to independent claims 1 and 13 above.

Regarding claims 12 and 24, Meier et al discloses an array of micro-mirrors as shown above wherein the corners of the supports are matched with corners of the corresponding micro-mirror (Shown in Figures 3-4, wherein the corners of supports "320" match the corners of micro-mirror "302"), but does not specifically disclose that the supports have a square shape. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made for the supports of Meier et al to be in a square shape since such a modification would have involved only a mere change in the shape of the supports and would not change the function of the supports. In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). Nevertheless, Meier et al further teaches of square posts for the purpose of supporting the spring on the substrate and to provide drive circuitry to the spring (Column 6, lines 36-49, wherein the support posts "116" are square shaped, Figures 3-4). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made for the supports of Meier et al to have a square shape since Meier et al further teaches of square posts for the purpose of supporting the spring on the substrate and to provide drive circuitry to the spring.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Huffman et al and Dvorkis et al read on with the current invention, but were not used in the above rejections since multiple rejections would be repetitious since they both disclose mirrors movable by a flexure springs which store and release energy.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessica T. Stultz whose telephone number is (571) 272-2339. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jessica Stultz
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February 11, 2005

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